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A FORM OF SEPTICÆMIA SUPERVENING ON TUBERCULOSIS IN FOWLS. By Stewart Stockman, *Professor of Pathology, Dick College, Edinburgh.*

(Read before the Society, June 17, 1898.)

History.—Mr H. O. Thomson, M.R.C.V.S., sent me from Yorkshire two dead fowls with the following history. "The birds are from a hen run at a farm on which there were 400 fowls at the commencement of the outbreak. In the space of four months 380 of the birds are dead. In two months I recorded as many as 180 deaths, and they are still dropping off. I have made careful *post-mortem* examinations on several birds, and find enlargement of the spleens with softening of the livers. At a time when I was not over busy I marked apparently healthy birds, and took the trouble to watch them for the greater part of a day. The incubative period seems to be very short; the birds die within six hours.[1]

"The first symptoms shown were dazed appearance, head hung down, feathers erect, and they dropped off the perch dead. Old as well as young birds are affected. Out of ten cocks only one has died so far. One bird has apparently recovered, but does not seem quite healthy, as it looks dull and listless. I have disinfected the houses and run, but still deaths occur, and I am afraid the ground to a considerable extent has become infected. I cannot discover the source of infection in this disease, whatever it be, as all the birds have been bred on the premises. . . . I shall be glad to have any information you can give me about the disease, and will be glad to send any further particulars desired."

On further inquiry I learned from Mr Thomson that fowls on a neighbouring farm were dying of what appeared to be a similar disease, and that many of them had small tubercle-like nodules

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[1] This I think must be a mistake. My experimental birds showed serious symptoms a few hours before death, but careful observation showed them to be seedy and emaciating for two or three days.

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in the liver. I also learned that none of the farmyard birds other than the fowl had suffered.

The dead birds sent to me were perfectly fresh; one of them had died only the day before.

Autopsy.—The birds were in medium condition. The spleens of both contained large tough tuberculous masses, from which I obtained the tubercle bacillus.

The mesentery and glands likewise showed true tuberculous lesions of old standing. The liver of one bird contained several nodules of a distinct yellow colour, which were undoubtedly tuberculous; that of the other showed nodules of a whitish colour, varying in size from a millet seed to a small pea. In cover-glass preparations made from the latter I failed to find any microbe whatever, but the tubercle bacillus was found in sections of the organ. The livers of two other birds sent to me later showed no lesions other than swelling and fatty degeneration, but nodules were present in the mesentery or spleen. I was at a loss to explain the large number of deaths after such an apparently short illness, so I thought it advisable to attempt cultures with the heart blood, and spleen pulp of the birds that had died the day before.

Broth tubes inoculated with material from the above sources, and incubated for about eighteen hours, gave a plentiful growth of a small oval bacillus rather like a coccus. Agar and gelatine cultures were made from the broth tubes. Later, I asked Mr Thomson to send me another bird. He sent me two dead ones perfectly fresh. These showed old tuberculosis of the spleen, with swelling and fatty degeneration of the liver.

From the heart blood and spleens of both birds I obtained cultures of the same bacillus.

It seemed probable that this microbe had something to do with the disease, so I resolved to try the effects of experimental inoculation.

Experiment 1.—A hen in good condition was inoculated with all antiseptic precautions under the skin of the chest with 20 mm. of a broth culture obtained from the heart's blood of one of the fowls sent by Mr Thomson. Five days afterwards the hen seemed little the worse, and I thought the result must be negative, seeing how quickly the birds on the farm had died. On the fifth day I gave the hen over her throat half a broth culture made from the spleen and incubated for five days. The day following she was seedy, somnolent, and inclined to crouch in a corner of the cage. She died with symptoms of diarrhœa on the morning of the seventh day from the start of the experiment.

Autopsy.—Under the skin at the seat of inoculation was a tough, yellowish, fibrinous material. There was slight necrosis of the underlying muscle. The pericardium contained a larger amount of fluid than normal. The liver was softened, and showed a few yellow nodules about the size of a pea. These I found to contain the tubercle bacillus. The spleen was enlarged to three times the normal, and contained several true tubercles of old standing. A few nodules were also found on the intestinal walls. The peritoneal cavity contained a large amount of clear fluid, and a blood-clot was present under the kidneys. Cover-glass preparations made from the heart blood and stained with thionine blue showed a few bacilli apparently in pure culture. Cultures of the microbe already mentioned, and to be afterwards described, were obtained on agar broth and gelatine with blood from the heart and from the clot in the abdominal cavity.

Experiment 2.—A cock in good condition was inoculated into the chest muscle with two small platinum loopsful of a twelve days old agar culture made from the blood of the hen used for experiment 1. Slight diarrhœa set in on the second day after inoculation, and the cock began to emaciate. On the night of the fourth day the bird did not look at all like dying, but on the fifth morning, at 10.30, he was found in a state of coma, and died at 11.30 A.M.

Autopsy.—The body was much emaciated. There was slight necrosis of the muscle at the seat of inoculation, and a small amount of œdema. The lungs were healthy in appearance. The pericardial sac contained a good deal of clear fluid. The spleen was much increased in size, and showed a large semi-fibrous tuberculous nodule which had become encapsuled. In sections made from the spleen I found the tubercle bacillus. Evidently this bird, like some of the others, had been affected with tuberculosis for a considerable time. The liver was enlarged, softer than normal, and contained many small whitish nodules about the size of a pin's head. These nodules were due to the tubercle bacillus. Cultures of the bacillus inoculated were obtained from the heart blood of this bird.

Experiment 3.—On the day that the cock was inoculated an apparently healthy hen received over her throat the remains of the agar culture used for experiment 2. On the seventh day the hen was ill. There was slight diarrhœa, listlessness, an inclination to crouch in a corner, and fading of the bright red colour of the wattles. She died emaciated on the tenth day after receiving the culture.

Autopsy.—The liver of this bird was swollen and fatty, but showed no tuberculous nodules. The spleen was enlarged to about twice the normal, and showed many small white pin-point nodules. On the mesentery were found many small whitish tubercles about the size of a pin's head. Cultures of the oval bacillus were obtained from the blood and spleen pulp. In the blood the microbes were numerous enough to admit of being seen in cover-glass preparations.

Experiment 4.—Two pigeons, A and B, were used for this experiment. A received over the throat half a broth culture four days old, and obtained from the blood of the first experimental hen. B received the other half of the same culture into the chest muscle. A never showed any signs of ill health, and lived for several weeks. B became very ill on the fifth day of the experiment. There was a tendency to diarrhœa, and the bird was rolled up in a corner. This pigeon died on the sixth day.

Autopsy.—Emaciation was not marked. At the seat of inoculation there was wide-spread necrosis of the muscle.

The necrotic area was of a white colour, with a few red streaks of less altered muscle running through it. Under the microscope the fibres were hyaline in appearance, and a considerable round-cell infiltration was present. The internal organs showed no alteration to the naked eye. Cover-glasses made with the blood showed the oval bacilli. Agar and broth tubes inoculated with the heart blood and spleen pulp gave abundant growths of the oval bacillus after twenty-four hours' incubation at 35° C.

Gelatine tubes inoculated by the stab method with material from the diseased muscle also gave very distinct growths after twenty-four hours at 18° C.

Experiment 5.—A young full-grown rabbit was inoculated into the thigh with two platinum wire loopsful of an eleven days' agar culture from the blood of the pigeon. The rabbit died on the fifth day. The liver was fatty, and showed a number of small white areas, which I afterwards found to be due to the *Coccidium oviforme.* The spleen was slightly enlarged. Cultures of the oval bacillus were obtained on broth and agar from the heart blood and spleen. Two other rabbits were inoculated with negative results. One of them was killed about a month after inoculation, and showed no lesion whatever. The bacillus was found to be harmless to the guinea-pig, no matter how inoculated.

The microbe is an oval bacillus measuring about 1·5 μ. When viewed endwise it looks like a coccus. There can be no question, however, about the purity of the culture, as it was tested several times in gelatine roll tubes.

Most of the rods occur singly, but a few are joined end to end in twos. The latter sometimes resemble diplococci, according to the way they are looked at. In hanging-drop preparations they are feebly motile. They are best stained by thionine blue or carbol fuchsin; they do not retain the stain by Gram's method.

Culture.—The bacillus grows best in a free supply of air, at a temperature between 30° and 37° C. As an anaërobe it hardly grows at all. The most suitable media are agar, broth, and gelatine. On potato the growth is almost imperceptible. When sown on *broth* the medium becomes opaque in a few hours at 37° C. After twenty-four hours the microbes have fallen to the bottom of the tube as a white deposit, and the broth becomes clear again. On *agar* the growth is very abundant. After twenty-four hours a large number of bluish-white colonies have appeared on the surface of the medium. These increase until they reach about an eighth of an inch in diameter, but they have little tendency to spread over the surface of the agar; they remain for a long time distinct.

On slanting *gelatine* the growth resembles that on agar. Inoculated by the stab method the colonies have grown along the whole length of the stab after twenty-four hours. The gelatine does not become liquefied. There is nothing very characteristic about the growth. It is most meagre at the bottom of the stab, and the white colonies show no tendency to spread through the gelatine. In gelatine roll tubes the growth is very slow, and little abundant. The colonies are circular in shape, white in colour, and do not exceed an eighth of an inch in diameter.

The most important thing about this bacillus seems to me to be its fatal effect on tuberculous fowls, while it appears to be non-pathogenic, or nearly so, for healthy birds. It is also interesting to note that it killed a rabbit affected with the *Coccidium oviforme*, although the healthy ones were little affected by it. This observation, I think, is fresh evidence in favour of what is taught about certain other microbes, namely, that they are only pathogenic to the enfeebled organism.